CLAIMS

1. A cardiac stimulation device comprising:

a first pair of electrodes configured for placement internally in a patient and in operable association with the patient's heart;

a current source operably associated with the first pair of electrodes and configured to produce a current therebetween;

a second pair of electrodes configured for placement internally in a patient and in operable association with the patient's heart, at least one of the electrodes of the second pair of electrodes being configured for placement in association with the left side of the patient's heart;

a voltage measuring circuit operably associated with the second pair of electrodes and configured to measure a voltage therebetween responsive to the current produced by the current source;

an impedance measuring circuit configured for measuring impedance as a function of the current produced by the current source and the voltage measured by the voltage measuring circuit; and

a stimulation circuit associated with the impedance measuring circuit and configured to stimulate the patient's heart as a function of the measured impedance.

2. The cardiac stimulation device of claim 1, wherein the at least one electrode of the second pair of electrodes comprises an electrode associated with the left ventricle.

3. The cardiac stimulation device of claim 1, wherein the at least one electrode of the second pair of electrodes comprises an electrode associated with the left atrium.

4. The cardiac stimulation device of claim 1, wherein electrodes of the second pair of electrodes each comprise a left side heart electrode.

5. The cardiac stimulation device of claim 4, wherein one of the left side heart electrodes comprises an electrode associated with the left atrium, and the other of the left side heart electrodes comprises an electrode associated with the left ventricle.

6. The cardiac stimulation device of claim 4, wherein each of the electrodes of the second pair are associated with the left atrium.

7. The cardiac stimulation device of claim 4, wherein each of the electrodes of the second pair are associated with the left ventricle.

8. The cardiac stimulation device of claim 1, wherein the first and second pair of electrodes have no electrodes in common.

9. The cardiac stimulation device of claim 1, wherein the first and second pair of electrodes share at least one common electrode.

10. The cardiac stimulation device of claim 1, wherein the device comprises an implantable device.

11. An implantable cardiac impedance measuring device comprising:

means for providing an electrical current between a first pair of electrodes that are configured for placement internally in a patient and in operable association with the patient's heart;

means for measuring a voltage, responsive to the electrical current, between a second pair of electrodes that are configured for placement internally of a patient and in operable association with the patient's heart;

means for calculating, from the electrical current and a corresponding measured voltage, an impedance; and

switch means for programmably selecting at least one electrode of the first and second pair of electrodes so that the at least one electrode comprises a left side heart electrode, the switch means enabling an impedance to be calculated that is associated with the patient's left side heart.

12. The implantable cardiac impedance measuring device of claim 11 further comprising stimulation means for electrically stimulating a patient's heart as a function of the impedance.

13. The implantable cardiac impedance measuring device of claim 11, wherein the switch means can be programmed to select multiple electrodes of the first and second pair of electrodes to comprise left side heart electrodes.

14. The implantable cardiac impedance measuring device of claim 11, wherein the switch means can be programmed to select all electrodes of the first and second pair of electrodes to comprise left side heart electrodes.

15. The implantable cardiac impedance measuring device of claim 11, wherein the at least one electrode comprises a left ventricular electrode.

16. The implantable cardiac impedance measuring device of claim 11, wherein the at least one electrode comprises a left atrial electrode.

17. A cardiac stimulation device comprising:

one or more computer-readable media;

one or more processors; and

instructions embodied on the one or more computer-readable media which, when executed by the one or more processors, cause the one or more processors to calculate an impedance using at least one left side heart electrode.

18. The cardiac stimulation device of claim 17, wherein the instructions cause the one or more processors to calculate the impedance using three or less left side heart electrodes.

19. The cardiac stimulation device of claim 17, wherein the at least one electrode comprises an electrode associated with the left atrium.

20. The cardiac stimulation device of claim 17, wherein the at least one electrode comprises an electrode associated with the left ventricle.

21. The cardiac stimulation device of claim 17, wherein the at least one electrode comprises multiple electrodes, at least one of which being associated with the left atrium.

22. The cardiac stimulation device of claim 17, wherein the at least one electrode comprises multiple electrodes, at least one of which being associated with the left ventricle.

23. The cardiac stimulation device of claim 17, wherein the at least one electrode comprises multiple electrodes, at least one of which being associated with the left atrium, at least another of which being associated with the left ventricle.

24. The cardiac stimulation device of claim 17, wherein the at least one electrode is only associated with the left atrium.

25. The cardiac stimulation device of claim 17, wherein the at least one electrode comprises multiple electrodes only associated with the left atrium.

26. The cardiac stimulation device of claim 17, wherein the at least one electrode is only associated with the left ventricle.

27. The cardiac stimulation device of claim 17, wherein the at least one electrode comprises multiple electrodes only associated with the left ventricle.

28. The cardiac stimulation device of claim 17 further comprising multiple leads operably associated with the one or more processors, each of the leads supporting one or more electrodes that can be used to provide an electrical current and/or sense a voltage from which the impedance can be measured.

29. A cardiac stimulation device comprising:

one or more computer-readable media;

one or more processors; and

instructions embodied on the one or more computer-readable media which, when executed by the one or more processors, cause the one or more processors to calculate an impedance using a multi-polar electrode configuration with at least one left side heart electrode.

30. The cardiac stimulation device of claim 29, wherein the multi-polar electrode configuration comprises a bipolar configuration.

31. The cardiac stimulation device of claim 29, wherein the multi-polar electrode configuration comprises a tripolar configuration.

32. The cardiac stimulation device of claim 29, wherein the multi-polar electrode configuration comprises a quadrapolar configuration.

33. A method of measuring an impedance using a cardiac stimulation device comprising:

establishing a current path between a first pair of electrodes configured for use internally of a patient;

measuring a voltage between a second pair of electrodes configured for use internally in a patient, at least one electrode of the second pair comprising a left side heart electrode; and

calculating an impedance based upon the established current and the measured voltage.

34. The method of claim 33, wherein the measuring a voltage comprises measuring a voltage where the at least one electrode of the second pair comprises an electrode associated with the left ventricle.

35. The method of claim 33, wherein the measuring a voltage comprises measuring a voltage where the at least one electrode of the second pair comprises an electrode associated with the left atrium.

36. The method of claim 33, wherein the measuring a voltage comprises measuring a voltage where the electrodes of the second pair of electrodes each comprise a left side heart electrode.

37. The method of claim 36, wherein the measuring a voltage comprises measuring a voltage where one of the left side heart electrodes comprises an electrode associated with the left atrium, and the other of the left side heart electrodes comprises an electrode associated with the left ventricle.

38. The method of claim 36, wherein the measuring a voltage comprises measuring a voltage where each of the electrodes of the second pair are associated with the left atrium.

39. The method of claim 36, wherein the measuring a voltage comprises measuring a voltage where each of the electrodes of the second pair are associated with the left ventricle.

40. The method of claim 33, wherein the establishing a current path and the measuring a voltage are performed where the first and second pair of electrodes have no electrodes in common.

41. The method of claim 40, wherein the establishing a current path and the measuring a voltage are performed where each electrode of the first and second pair are left side heart electrodes.

42. The method of claim 41, wherein the establishing a current path and the measuring a voltage are performed where each pair of electrodes comprises a left atrial electrode and a left ventricular electrode.

43. The method of claim 40, wherein the establishing a current path and the measuring a voltage are performed where the second pair of electrodes comprises electrodes associated with the left ventricle.

44. The method of claim 40, wherein the establishing a current path and the measuring a voltage are performed where the second pair of electrodes comprise electrodes associated with the left atrium.

45. The method of claim 40, wherein the establishing a current path and the measuring a voltage are performed where one electrode of the second pair comprises an electrode associated with the left atrium, and the other electrode of the second pair comprises an electrode associated with the left ventricle.

46. The method of claim 40, wherein the establishing a current path and the measuring a voltage are performed where one electrode of the first pair comprises an electrode associated with the left ventricle, and one electrode of the second pair comprises an electrode associated with the left ventricle.

47. The method of claim 40, wherein the establishing a current path and the measuring a voltage are performed where one electrode of the first pair comprises an electrode associated with the left atrium, and one electrode of the second pair comprises an electrode associated with the left atrium.

48. The method of claim 40, wherein the establishing a current path and the measuring a voltage are performed where only one electrode of the second pair comprises an electrode associated with the left atrium.

49. The method of claim 48, wherein the establishing a current path and the measuring a voltage are performed where only one electrode of the first pair comprises an electrode associated with the left atrium.

50. The method of claim 33, wherein the establishing a current path and the measuring a voltage are performed where the first and second pair of electrodes share at least one common electrode.

51. The method of claim 50, wherein the establishing a current path and the measuring a voltage are performed where the at least one shared electrode is associated with the left ventricle.

52. The method of claim 50, wherein the establishing a current path and the measuring a voltage are performed where the at least one shared electrode is associated with the left atrium.

53. The method of claim 50, wherein the establishing a current path and the measuring a voltage are performed where the first and second pair share two common electrodes.

54. The method of claim 53, wherein the establishing a current path and the measuring a voltage are performed where the two common electrodes are associated with the left ventricle.

55. The method of claim 53, wherein the establishing a current path and the measuring a voltage are performed where one of the two common electrodes is associated with the left atrium, and the other of the common electrodes is associated with the left ventricle.

56. The method of claim 53, wherein the establishing a current path and the measuring a voltage are performed where only one of the shared electrodes is associated with the left side of the heart.

57. The method of claim 33 further comprising controlling stimulation therapy as a function of the impedance.

58. One or more computer-readable media having computer-readable instructions thereon which, when executed by one or more processors, cause the processors to implement the method of claim 33.

59. A method of assessing a patient's cardiac condition comprising:

establishing a current path between a first pair of electrodes configured for use internally in a patient;

measuring a voltage between a second pair of electrodes configured for use internally of a patient, at least one electrode of the second pair comprising a left side heart electrode;

calculating an impedance based upon the established current and the measured voltage; and

based on the calculated impedance, determining one or more physiological parameters for assessing a patient's cardiac condition.

60. The method of claim 59, wherein the determining comprises determining a respiration parameter.

61. The method of claim 59, wherein the determining comprises determining a parameter associated with left ventricular wall dynamics.

62. The method of claim 59, wherein the determining comprises determining a parameter associated with left ventricular volume.

63. One or more computer-readable media having computer-readable instructions thereon which, when executed by one or more processors, cause the processors to implement the method of claim 59.

64. One or more computer-readable media having computer-readable instructions thereon which, when executed by one or more processors, cause the processors to implement the method of claim 60.

65. One or more computer-readable media having computer-readable instructions thereon which, when executed by one or more processors, cause the processors to implement the method of claim 61.

66. One or more computer-readable media having computer-readable instructions thereon which, when executed by one or more processors, cause the processors to implement the method of claim 62.